

What Is Claimed Is:

1. A method for monitoring an operating state of at least one tire of a wheel of a vehicle, comprising:

5 selecting one of at least two different monitoring modes as a function of at least one driving state variable that represents a driving state of the vehicle and determined on the vehicle;

10 monitoring at least one tire state variable that represents a current operating state of the tire; and

 monitoring at least one calibration variable that represents a target state of the tire.

2. The method as recited in Claim 1, wherein the monitoring mode is selected as a function of a comparison of a vehicle speed to a predefined limit value, and wherein a transition from a first monitoring mode into a second monitoring mode occurs when:

15 the comparison indicates an exceedance of the limit value by the driving state variable; and

20 the exceedance of the limit value persists at least for a predefined period of time;

25 and wherein a check for further change of monitoring modes is terminated after the transition from the first monitoring mode into the second monitoring mode is completed.

3. The method as recited in Claim 1, wherein a first monitoring mode and a second monitoring mode each contain at least one calibration mode, and wherein for each calibration mode, at least one calibration variable is determined as a function of at least one of a tire state variable, a driving state variable, a calibration request, and the selected monitoring mode.

35 4. The method as recited in Claim 3, wherein the calibration

variable is determined as a function of the number of tire state variables acquired and the selected monitoring mode, and wherein at least one of the following is performed:

5 determining a calibration variable of a first type when at least a first predefined number of tire state variables have been considered for the determination of the calibration variable; and

10 determining a calibration variable of a second type when a second predefined number of tire state variables have been considered for the determination of the calibration variable.

15 5. The method as recited in Claim 4, wherein the calibration variable is determined as an average of the number of tire state variables that have been considered for the determination of the calibration variable.

20 6. The method as recited in Claim 4, wherein the determination of the calibration variable of the first type is performed until a prerequisite condition for determination of the calibration variable of the second kind type is reached, and wherein upon determination of the calibration variable of the second type, the determination of the calibration variable is terminated, and wherein the method further comprises:

25 beginning the determination of the calibration variable again when a calibration request is made.

30 7. The method as recited in Claim 3, further comprising: detecting a malfunction of the tire when the determined tire state variable lies outside a predefined range with respect to the calibration variable of the monitoring mode, wherein the predefined range is selected as a function of at least one of a driving state variable and the number of tire state variables that have been considered for the determination of the calibration variable.

8. The method as recited in Claim 1, wherein for monitoring of the tire state, the at least one tire state variable is determined by a difference in wheel rotation speeds between at least two wheels, and wherein the difference in wheel rotation speeds is calculated in at least one of the following ways:
- 5 calculating a difference in wheel rotation speeds between wheels of one axle;
- calculating a difference in wheel rotation speeds between wheels positioned diagonally with respect to one
- 10 another;
- calculating a difference in wheel rotation speeds between a sum of wheel rotation speeds of the wheels of a front axle and a sum of wheel rotation speeds of the wheels of a rear axle; and
- 15 calculating a difference in wheel rotation speeds between a sum of wheel rotation speeds of the wheels of the left side and a sum of the wheel rotation speeds of the wheels of the right side;
- 20 wherein the calculated difference in wheel rotation speeds is normalized to the vehicle speed, and wherein the wheel rotation speeds are determined as a function of a wheel dynamics variable.
9. The method as recited in Claim 3, wherein the calibration request is performed at a point in time defined as a function of at least one of a tire change, an operation adding air to the tire, and an instruction initiated by a driver of the vehicle.
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10. The method as recited in Claim 7, wherein at least one of the following actions is taken when a malfunction is detected:
- 30 informing the driver of the vehicle regarding the detected malfunction; and
- 35 performing on at least one of a braking system and an active steering system of the vehicle a remedial action to

counteract the cause of the malfunction.

11. The method as recited in Claim 10, wherein the informing
of the detected malfunction is achieved at least one of
5 acoustically and optically.

12. The method as recited in Claim 2, wherein the exceedance
of the limit value for the predefined period of time indicates
a plastically deformed state of the tire.

10 13. An apparatus for monitoring an operating state of at
least one tire of a wheel of a vehicle, comprising:
an arrangement for selecting one of at least two
different monitoring modes as a function of at least one
15 driving state variable that represents a driving state of the
vehicle and determined on the vehicle;
an arrangement for monitoring at least one tire state
variable that represents a current operating state of the
tire; and
20 an arrangement for monitoring at least one calibration
variable that represents a target state of the tire.

14. The apparatus as recited in Claim 13, wherein a first
monitoring mode and a second monitoring mode each contain at
25 least one calibration mode, and wherein the apparatus further
comprises:
an arrangement for determining, for each calibration
mode, at least one calibration variable as a function of at
least one of a tire state variable, a driving state variable,
30 a calibration request, and the selected monitoring mode.

15. The apparatus as recited in Claim 14, wherein the
calibration variable is determined as a function of the number
of tire state variables considered and the selected monitoring
35 mode, and wherein the arrangement for determining at least one

calibration variable performs at least one of the following:

determining a calibration variable of a first type when at least a first predefined number of tire state variables have been considered for the determination of the calibration variable; and

determining a calibration variable of a second type when a second predefined number of tire state variables have been considered for the determination of the calibration variable.

10 16. The apparatus as recited in Claim 15, wherein the calibration variable is determined as an average of the number of tire state variables that have been considered for the determination of the calibration variable.

15 17. The apparatus as recited in Claim 14, wherein a malfunction of the tire is detected when the determined tire state variable lies outside a predefined range with respect to the calibration variable of the monitoring mode, and wherein the predefined range is selected as a function of at least one of a driving state variable and the number of tire state variables that have been considered for the determination of the calibration variable.

20 25 18. A computer-readable medium storing a sequence of program codes executable on a computer, the sequence of program codes performing a method of monitoring an operating state of at least one tire of a wheel of a vehicle, comprising the steps of:

30 selecting one of at least two different monitoring modes as a function of at least one driving state variable that represents a driving state of the vehicle and determined on the vehicle;

monitoring at least one tire state variable that represents a current operating state of the tire; and

35 monitoring at least one calibration variable that

represents a target state of the tire.

19. The computer-readable medium as recited in Claim 18,
wherein a first monitoring mode and a second monitoring mode
5 each contain at least one calibration mode, and wherein for
each calibration mode, the sequence of program codes further
performing the step of:

10 determining at least one calibration variable as a
function of at least one of a tire state variable, a driving
state variable, a calibration request, and the selected
monitoring mode.

15 20. A computer program product having a sequence of program
codes for performing a method of monitoring an operating state
of at least one tire of a wheel of a vehicle, comprising the
steps of:

20 selecting one of at least two different monitoring modes
as a function of at least one driving state variable that
represents a driving state of the vehicle and determined on
the vehicle;

monitoring at least one tire state variable that
represents a current operating state of the tire; and

monitoring at least one calibration variable that
represents a target state of the tire;

25 wherein a first monitoring mode and a second monitoring
mode each contain at least one calibration mode, and wherein
for each calibration mode, at least one calibration variable
is determined as a function of at least one of a tire state
variable, a driving state variable, a calibration request, and
30 the selected monitoring mode.